

SMALL-SIZED INFORMATION PROCESSOR CAPABLE OF SCROLLING SCREEN IN ACCORDANCE WITH TILT, AND SCROLLING METHOD THEREFOR

BACKGROUND OF THE INVENTION

The present invention relates to a small-sized information processor of the hand-held type which can be used while being carried. More particularly, it relates to an expedient for scrolling the display screen of such a small-sized information processor.

In scrolling the display screen of an information processor, there has heretofore been usually employed an operating method wherein the scrolling is started or stopped by actuating specified keys on a keyboard or entering a command input from a pointing device.

Besides, according to a technique disclosed in the official gazette of Japanese Patent Application Laid-open No. 52891/1985, the display screen of an information processor of the desktop type is mounted on a base so as to be turnable in any direction, whereby this display screen can be scrolled by turning it.

Also, in a case where a small-sized information processor is used while being held in one hand, a scrolling action needs to be performed using the other hand which is not holding the information processor, especially when looking at the content of an electronic publication or a document which has already been entered. Therefore, the operability of the small-sized information processor is problematic.

In this regard, the aforementioned technique of Japanese Patent Application Laid-open No. 52891/1985 concerns a desktop type information processor, and it is not applicable to an information processor which is used while being held in one hand.

SUMMARY OF THE INVENTION

The present invention has for its object to eliminate the problem stated above, and to provide a small-sized information processor which, when it is used while being held in one hand, permits a scrolling action that does not require any operation by the other hand.

In order to accomplish this object, according to the present invention, a small-sized information processor which has, at least, a display device provided with a display screen and which is used while being held in one hand, can comprise command input means for entering a command for scrolling the display screen, in the state in which the small-sized information processor is held in one hand; tilt detection means for detecting a relative tilt of the small-sized information processor with respect to a reference tilt thereof, taken to be the tilt at a point in time at which the scroll command is entered; and scroll means for scrolling the display screen on the basis of the relative tilt detected by the tilt detection means.

Besides, it is possible that the tilt detection means detects a tilt direction and a tilt angle of the small-sized information processor, and that the scroll means determines a scrolling direction of the display screen on the basis of the detected tilt direction, and a scrolling speed thereof on the basis of the detected tilt angle.

Further, it is possible that the command input means includes a switch which accepts the scroll command, and that the switch is mounted at a position at which it can be

manipulated with a finger of the hand holding the small-sized information processor.

When the scroll command has been entered through the command input means (that is, when the scroll start switch has been depressed), the tilt direction and tilt angle of the display device at this time (the initial tilt direction and tilt angle) are detected as reference criteria by the tilt detection means (in other words, a tilt sensor). After a predetermined time period, the tilt direction and tilt angle (the second tilt direction and tilt angle) of the display device are detected by the tilt detection means. Subsequently, the relative tilt direction of the display device with respect to the reference tilt direction is judged, and the relative tilt angle thereof with respect to the reference tilt angle is calculated by subtracting the initial tilt angle from the second tilt angle. Thereafter, the scroll means scrolls the display screen of the display device on the basis of the relative direction and angle. The scrolling speed of the display screen may well be changed in accordance with the relative tilt angle.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram showing an embodiment of a small-sized information processor according to the present invention;

FIG. 2 is an explanatory diagram showing the pointer of a display unit, and the relationship between the display screen thereof and a display storage unit;

FIG. 3 is an exterior view of the small-sized information processor in the embodiment;

FIG. 4 is an explanatory diagram showing an operating method for upward scrolling;

FIG. 5 is an explanatory diagram showing an operating method for downward scrolling;

FIG. 6 is a flow chart showing the steps of a scrolling process;

FIG. 7 is a view showing the external shape of a tilt sensor;

FIG. 8 is a view showing a vertical section of the tilt sensor;

FIG. 9 is a view showing the internal construction of the tilt sensor;

FIG. 10 is a diagram for explaining the outputs of photosensors for the clockwise rotation of the tilt sensor;

FIG. 11 is a diagram for explaining the outputs of the photosensors for the counterclockwise rotation of the tilt sensor;

FIG. 12 is a diagram for explaining a method of measuring a tilt angle;

FIG. 13 is a flow chart showing the substeps of the tilt angle correction step (603 in FIG. 6);

FIG. 14 is an explanatory diagram showing the relationship between the rotational directions of the tilt sensor and the output pulses of the photosensors; and

FIG. 15 is a diagram for explaining a light source and a light source input.

PREFERRED EMBODIMENTS OF THE INVENTION

Now, an embodiment of the present invention will be described with reference to FIGS. 1 thru 6. FIG. 1 is a block diagram of a small-sized information processor in the embodiment of the present invention. FIG. 2 is an explanatory diagram showing the operation of the pointer 107 (in